

# The Governor's School of New Jersey



## Application for the 2013 Governor's School of Engineering & Technology at Rutgers University June 30<sup>th</sup> - July 26<sup>th</sup>, 2013

### PROGRAM OVERVIEW

The Governor's School of Engineering & Technology (GSET) is a unique and intensive residential summer program that brings together some of New Jersey's most talented and motivated high school students. At no cost to their families, students spend one month of the summer following their junior year studying on the campus of the Rutgers University School of Engineering. Through team-based courses in areas such as "Robot Soccer" and research projects ranging from designing water purification systems for the developing world to using "Wiimotes" for medical rehabilitation, students collaborate on cutting-edge topics. The scholars work with peers and professors who are both very smart and very enthusiastic about engineering and technology.

GSET aims high. Scholars gain hands-on experience in research and work on challenging and open-ended problems with others who share their love for engineering and technology. Free of grades and official credit, GSET emphasizes current research trends and teamwork. The hands-on learning environment is unique, non-traditional, and inspirational. For many of our scholars, this is their first opportunity to collaborate with other students with the same academic talent and motivation. It's no surprise, then, that our alumni consider GSET to be not just an important educational foundation, but also one of the best experiences of their lives.

Throughout the program, scholars are encouraged to take personal responsibility for their education and to develop their ideas; entrepreneurship is highly encouraged. Governor's School scholars can expect to be challenged and to work very hard. In return, they will reap the benefits of an environment in which discovery and the pursuit of knowledge are primary, but in which everyone has a lot of fun. Scholars can also expect to develop strong academic relationships with their research mentors at Rutgers, engineering professionals, and each other.

### ELIGIBILITY

To be considered for the Governor's School of Engineering & Technology, a student must meet the following criteria:

- The student must be a New Jersey resident and be a high school junior during the 2012-2013 school year.
- The student must have a very strong interest in engineering and technology and be committed to the acquisition of knowledge and the pursuit of opportunities in that field.
- The student must be willing to live on campus for the duration of the program. Saturdays and Sundays make up part of the program; there will be no weekend leaves of absence.
- The applicant must be one of the top students in his or her school. The student should have primarily "A" grades in honors math and science classes and outstanding scores on standardized achievement tests. Students who have demonstrated very strong abilities in engineering outside the classroom can also be strong candidates for the Governor's School in spite of weaker standardized test scores. Competitive candidates often rank in the top 5% of their class and score above the 90<sup>th</sup> percentile on standardized tests. A student whose standardized test scores are below the 90<sup>th</sup> percentile but rank among the best in this/her school may still apply if he or she is otherwise qualified.

The Governor's School encourages all qualified applicants regardless of sex, race, color, creed, national origin, or physical handicap.

## PROGRAM DESCRIPTION

**Core Courses:** *Robotics* - students work in teams of 4 to build and program robots to solve design challenges and complete tasks; and *Physics* - this course is about some of the most exciting physics of the last 100 years, how they were discovered, and what we might expect to learn in the near future.

**Elective Courses:** Each Engineering & Technology scholar has the opportunity to select one elective from each of the three groups of electives.

The electives for 2012 were as follows: Elective Group A: *The Math behind the Machine; Computational Methods in Science and Engineering; Exploring Biomedical Engineering – Nanotechnology, Genetic Manipulation, and the Studies of the Central Nervous System; Biofuels – Learning about It, Making Some, and Analyzing It; Introduction to Android Development; and Engineering the Nation’s Infrastructure from Conception to Repair*; Elective Group B: *Biomedical Engineering Experimentation; Energy and Sustainability; Introduction to Digital Logic, the Roots of Computer Engineering; Solar Energy – How Do We Capture It? How Can We Make It Better?; and Shake, Rattle and Roll – Building Machines with a Sense of Balance*; Elective Group C: *Android for Java Developers; Earthquake Resistant Structure; Entrepreneurship “Cashing in on Innovation;” Introduction to Material Science; Pharmaceutical Engineering; REEG: Reverse Engineering Electronic Gadgets*

**Research Projects:** The cornerstone of the Engineering & Technology experience is a small group research and design project, completed under the tutelage of an experienced research mentor from academia or industry. In groups of three or four, scholars investigate and attempt to solve a complex and novel problem. Each group writes a conference-style research paper and presents its results at the Governor’s School Research Symposium in front of an audience of professors, dignitaries, industry members, and invited guests. At the conclusion of the research experience, scholars should expect to have made significant connections with their research mentors and to have gained scientific maturity. The project topics vary from year to year and are aimed at having representation from each engineering discipline.

The 2012 projects were: *Semiconductors and More...; The Road to Clean Water; CAD Modeling of Insects and Insect Flight Animation; Clocking In: Importance of Interior Elements in a Construction Project; Guide for Electric Transmission Line Routing; Brain Control; Pharmaceutical Engineering: Optimization of a Pharmaceutical Formulation; Quality Engineering in a Major Manufacturing Facility; Aluminum Air-Foil Car Optimization; Improving the Manufacturing Process at L’Oreal; Multiple Coordinated Harmonics in a Simple Dynamical System; Autonomic Cloud Computing!; Exploring Electric Vehicles with PSEG; Duckweed: Dual Platform for Renewable Fuels and Wastewater Remediation; Smart Clothes and Smart Phones; Smart Phone App Analysis; Developing a High-Altitude Observation Platform (HOP); Android in the Real-World; Industrial-Strength Droid; Wireless Body Area Sensor Networks for Bio-medical Applications; Gesture Recognition Biofeedback; Migration Assay for Improving Chronic Wounds; Robot Hide and Seek... ; Exploring Possibilities through P.I.E.: Piezoelectric Investigations and Experiments; Micromixing in Microfluidic devices.* A list of GSET research projects and links to the research papers are available at <http://soe.rutgers.edu/gov-school-research-papers>.

**Site Tours:** Each Engineering & Technology scholar has the opportunity to visit local corporations to learn about future career opportunities. The tour destinations change each year. Tours for 2012 were conducted at: Anderson/Silver Line; Colgate-Palmolive; Federal Aviation Administration (FAA); Johnson & Johnson; Juniper Networks; L’Oreal; Lockheed Martin; Merck; Morgan Stanley; Metropolitan Transportation Authority (MTA); Picatinny Arsenal; Princeton Plasma Physics Laboratory (PPPL); PSEG Nuclear; and The EcoComplex.

**Guest Speakers:** Distinguished guest speakers are a part of each year’s program. These speakers are leaders in either academia or industry, and are excited to share current developments in engineering as well as career advice. Scholars in the 2012 program heard from: Dr. Thomas Papathomas, Busch Campus Dean, Professor in Biomedical Engineering and Associate Director of the Laboratory of Vision Research at Rutgers University; Dr. Paul Falkowski, Director of the Rutgers Energy Institute and Professor of Geological and Marine Sciences; Dr. Alicia Abella, Executive Director of Network and Services Research Lab at AT&T; Guy Story, CTO & Chief Scientist at Audible Inc.

**Enrichment Activities:** A number of supplementary activities reinforce ideas in engineering.

- *Process Engineering:* Scholars work in teams of 17 to pilot a simulated spaceship.
- *Life Skills Days* provide exposure to many important skills an engineer needs to know, yet may not have seen before.
- *College Question and Answer* session with current scholars from elite universities, a half-day simulation of the team design process, recreational athletics activities, and a student talent show.
- Activities based on admitted scholars’ expressed interests are also included, customizing each year’s program.

## THE SELECTION PROCESS

To apply for the Governor's School of Engineering & Technology, a student must be nominated by his or her high school's nominating committee. If the high school's junior class contains at most 325 students, only one student may be nominated for each Governor's School program. If the high school's junior class has between 326 and 650 students, two students may be nominated for each Governor's School program. Three students may be nominated only if the junior class comprises of more than 650 students.

Students chosen by their high school's nominating committee are termed "nominees." The nominee is responsible for completing all parts of the application, ensuring that all necessary supplements (including transcripts, copies of PSAT scores, and the principal's signature) are in order, and verifying that the application has been submitted before the deadline. The application must be mailed by the high school, not the applicant, and sent **directly to Rutgers University** at the following address. **Applications must be postmarked on or before January 11, 2013.**

Governor's School of Engineering & Technology  
Rutgers University School of Engineering  
98 Brett Rd., Room B-110  
Piscataway, NJ 08854

The Governor's School will confirm receipt of the application by late February in an email to the applicant. Please note that incomplete applications (missing any required document) will not receive full consideration. At Rutgers, a panel of professors, researchers, and educators will review nominees' applications. Using the criteria below, this panel will choose the Governor's Scholars and invite those students to attend the Governor's School. The committee's decision will be emailed to the student on April 4, 2013. The admissions process is very competitive; in recent years, 15% - 25% of nominees have been offered admission.

## SELECTION CRITERIA

The selection committee for the Governor's School of Engineering & Technology aims to craft a student body made up of New Jersey's most talented and enthusiastic students. Our student body should be diverse in myriad ways. Our students should possess a great range of gifts in technology, the arts, humanities, and the sciences. Overall, the committee chooses the students who will best take advantage of the opportunities presented by the Governor's School.

Decisions are based on the following qualitative and quantitative criteria:

- The student's high school transcript and class rank, which should demonstrate that the student is at or near the top of his or her class.
- The student's essays and reasons for wanting to attend the Governor's School
- Letters of recommendation
- The student's extracurricular activities and community service pursuits
- The student's academic and extracurricular honors and accomplishments
- The student's standardized test scores (PSAT preferred)

We expect Governor's Scholars to exhibit great creativity and a unique passion for the nature of our Governor's School. We look for students who have shown a strong interest in engineering, technology, science, and mathematics, as well as an open mind and the ability to work on a team to explore these interests further. We want to know what a student hopes to gain from the Governor's School experience, as well as what he or she hopes to contribute to the program. In general, students who have demonstrated a fervent interest in engineering and technology both inside and outside of the classroom will be most successful in the admissions process. A student with perfect standardized test scores but only superficial interest in the nature of the school is not a competitive candidate. Of course, our scholars are not only devoted to engineering and technology, but *also* have outstanding test scores and rank at the absolute top of their class. We are privileged to choose the best of the best.

## CONTACT INFORMATION

Dr. Ilene Rosen, Program Director

Jean Patrick Antoine, Assistant Director

**Web:** <http://soe.rutgers.edu/gset> (Engineering only)  
<http://www.nj.gov/govschool/> (all programs)

**Telephone:** (848) 445-4753

**Fax:** (732) 445-5878

**Postal Mail:** Governor's School of Engineering & Technology  
Rutgers Engineering Office of Student Development  
98 Brett Rd., Room B-110  
Piscataway, NJ 08854

## APPLICATION INSTRUCTIONS

**Step 1:** Review the program information and descriptions in this packet. We also highly recommend that you and your family visit our web site at <http://soe.rutgers.edu/gset> in order to see pictures and videos and research papers from past years.

**Step 2:** Complete the Application Cover Sheet page (page 5 of this packet). The cover sheet should be the first page of your submitted application.

**Step 3:** Include the Application Checklist (page 6 of this packet) as the second page of your application. Portions of this checklist must be completed by your school principal.

**Step 4:** Attach a list of your extracurricular activities in order of their importance to you, with emphasis on activities requiring a substantial amount of your time. These can include school sponsored activities, work experience, community service, as well as science, artistic or athletic programs. Be sure to include leadership roles you hold in any of these activities and the amount of time you spend on these activities. Along with this list, please note any honors (academic or extracurricular) that you have received.

**Step 5:** Include answers to each of the following essay questions and short responses. We recommend writing about 1 page, single spaced, for each essay question. The short responses can be answered in about 2 paragraphs each.

Essay 1) Create an autobiographical sketch of your background, history, interests, and ambitions. Be sure to describe what makes you unique.

Essay 2) Why would you like to attend the Governor's School of Engineering and Technology? What do you hope to gain from and contribute to the program? Be sure to tell us about your interests in engineering and technology, how they've developed, and any steps you've taken to explore these disciplines.

Short Response 1) Tell us about your most meaningful extracurricular activity or interest.

Short Response 2) Discuss an idea in engineering, technology, science or math that you find fascinating. Why does it intrigue you? You can choose a topic as general as a whole discipline or as specific as a particular problem, challenge, or invention.

Short Response 3) Propose a specific engineering or technology problem you'd like to be working on ten years from now. Why is the problem interesting, and how do you hope to approach it?

**Step 6:** Include recommendation letters from two people not related to you. At least one of these letters must come from a high school teacher. The second letter may come from another teacher, a club advisor, or a mentor.

**Step 7:** Verify that your high school will include your official transcript (including junior year grades) and official 2012 PSAT scores. If you did not take the PSAT in 2012, include your 2011 scores. You may also include your SAT scores. If you have not taken the PSAT or SAT, be sure your principal indicates this on his or her checklist.

**Step 8:** If your junior year grades or junior year PSAT scores are not available at the time you submit your application, please forward them to the selection committee at Rutgers once they become available.

**Step 9:** Once your application is complete, it is your responsibility to verify that the application has been mailed to Rutgers University by the **January 11, 2013** deadline.

## DATES TO REMEMBER

**January 11, 2013:** Completed applications must be mailed by the high school to Rutgers University and postmarked by this date.

**By late February, 2013:** You will receive an email confirming the receipt of your application.

**April 4, 2013:** You will receive an email announcing the selection committee's decision.

**June 30 to July 26, 2013:** The Governor's School will be in session on the campus of Rutgers University.



## The Governor's School of New Jersey

### **2013 GOVERNOR'S SCHOOL OF ENGINEERING & TECHNOLOGY at Rutgers University**

#### **Application Cover Sheet**

Please visit the Governor's School of Engineering & Technology web site at:

<http://soe.rutgers.edu/gset/2013application>

Follow the link to the 2013 Applicant Information Data form:

1. Complete and submit this form.
2. Be sure to print the confirmation screen after submitting the form.
3. Attach the printed document to this application.

#### **IMPORTANT DATES**

##### **January 11, 2013**

Applications postmarked.

##### **April 4, 2013**

Admissions decisions are announced by email.

##### **June 30 - July 26, 2013**

The Governor's School of Engineering & Technology is in session.

#### **Additional Information:**

Please indicate the three engineering/technology disciplines that most interest you (i.e. electrical, mechanical, biomedical, civil, industrial, material science, chemical, etc.):

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

#### **STUDENT AND PARENT CERTIFICATION**

\_\_\_ I am a resident of New Jersey.

\_\_\_ I expect to be a high school senior in the 2013-2014 school year.

\_\_\_ I am willing and able to attend the entire Governor's School session.

\_\_\_\_\_  
*Signature of Student*

\_\_\_\_\_  
*Date*

This is to certify that I give my permission for the student named above to participate in the Governor's School of Engineering & Technology at Rutgers University, in full-time residence.

\_\_\_\_\_  
*Signature of Parent/Guardian*

\_\_\_\_\_  
*Date*

# APPLICATION CHECKLIST

(Please include as "Page 2" of your application)

## **NOMINEE'S CHECKLIST:**

- I've included the Application Cover Sheet as Page 1 of my application.
- I've included this checklist as Page 2 of my application.
- I've attached a list of my extracurricular activities and my extracurricular and academic honors.
- I've included responses to all requested essay prompts as per the guidelines on Page 4.
- I've attached two letters of recommendation as per the guidelines on Page 4.
- My school has included my official high school transcript and copies of my PSAT (or other standardized test) scores.
- I am a resident of the state of New Jersey and will complete my junior year of high school in June 2013.
- I have kept a copy of my application for my own records. If my current PSAT scores or transcript were not included, I will forward them to Rutgers University once they become available.

I have reviewed the checklist above, and have included all necessary and appropriate application materials. All of the information submitted as part of my application is factual and truthful to the best of my knowledge.

\_\_\_\_\_  
Name of Nominee (please print)

\_\_\_\_\_  
Nominee's Signature

## **PRINCIPAL'S CHECKLIST:**

- The nominee is one of our top students and has expressed a strong interest in the Governor's School of Engineering and Technology.
- Our school has nominated the correct number of students. (If the junior class has 1 – 325 students, 1 nominee is permitted. If there are 326 – 650 students, 2 nominees are permitted. If there are more than 650 juniors, 3 nominees are permitted.)
- The nominee has included his/her application Cover Sheet, this checklist, a list of activities and honors, essay responses, and two letters of recommendation (at least one letter from a high school teacher; the other may be from another teacher, mentor, or advisor)
- I have included the nominee's high school transcript and copies of his or her PSAT (or other standardized test) scores.
  - The transcript includes grades from the first marking period of the 2012-2013 school year.
  - The student will forward his or her junior year grades to the Governor's School once they become available.
  - I have included the student's 2012 PSAT scores. (Preferred)
  - The student did not take the PSAT in 2012. I have included his/her 2011 PSAT scores.
  - I have included the student's SAT scores.
  - No PSAT / SAT scores are available for this student.
- The nominee is a conscientious and eager student, and ranks near the top of his/her class.

Nominee's high school GPA \_\_\_\_\_ Number of Students in Junior Class \_\_\_\_\_ Nominee's Class Rank \_\_\_\_\_
- The nominee's standardized test scores are among the best in our school.

PSAT Scores: Verbal \_\_\_\_\_ Math \_\_\_\_\_ Writing \_\_\_\_\_ Test Date (circle one): 2011 2012 2013
- This student has not been nominated to more than one Governor's School.
- The nominating high school has kept a copy of this application on file.
- The student has included answers to the three short response questions.

I have reviewed the checklist above, and have included all necessary and appropriate application materials. All of the information submitted as part of this application is factual and truthful to the best of my knowledge.

\_\_\_\_\_  
Name of Principal (please print)

\_\_\_\_\_  
Principal's Signature